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Anxiety disorders, gender nonconformity, bullying and self-esteem in sexual minority adolescents: Prospective birth cohort study

Abbreviated title: Anxiety disorders in sexual minority adolescents

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Abstract

Background

Sexual minority adolescents (i.e. youth not exclusively heterosexual) report more anxiety than heterosexual youth on symptom questionnaires but no research has used standardised diagnostic tools to investigate anxiety disorder risk. This study uses a UK birth cohort to investigate the risk of anxiety disorders in sexual minority and heterosexual youth using a computerised structured clinical interview and explores the influence of gender nonconformity, bullying and self-esteem.

Methods

Participants were 4,564 adolescents (2,567 girls and 1,996 boys) from the Avon Longitudinal Study of Parents and Children (ALSPAC). Logistic regression analysis was performed to investigate the association between sexual orientation at 15.5 years and the presence of an anxiety disorder at 17.5 years. Covariates including maternal occupation, ethnicity, mother-reported childhood gender nonconformity at 30, 42 and 57 months, child-reported gender nonconformity at 8 years, child-reported bullying between 12-16 years and self-esteem at 17.5 years were added sequentially to regression models.

Results

Sexual minority adolescents (i.e. those not exclusively heterosexual) had higher early childhood gender nonconformity (CGN), lower self-esteem and reported more bullying than adolescents identifying as 100% heterosexual. Minority sexual orientation at 15.5 years was associated with increased risk of an anxiety disorder at 17.5 years for girls (OR 2.55, CI 1.85-3.52) and boys (OR 2.48, CI 1.40-4.39). Adjusting for ethnicity, maternal occupation, mother-reported and child-reported CGN had minimal impact on this association. Adjusting for bullying between 12-16 years and self-esteem

at 17.5 years reduced the strength of the associations, although the overall association remained significant for both sexes (girls OR 2.14 and boys OR 1.93).

Conclusions

Sexual minority youth are at increased risk of anxiety disorders relative to heterosexual youth at 17.5 years. Bullying between 12-16 years and lower self-esteem may contribute to this risk.

Keywords

Adolescence, anxiety, ALSPAC, childhood gender nonconformity, longitudinal, prospective, sexual minority, sexual orientation.

Abbreviations

Childhood Activities Inventory (CAI).

Childhood gender nonconformity (CGN).

Avon Longitudinal Study of Parents and Children (ALSPAC),

Clinical Interview Schedule-Revised (CIS-R),

Pre-school Activities Inventory (PSAI).

A systematic review of mental health problems in sexual minority adolescents (i.e. youth not exclusively heterosexual) indicated that this group report increased levels of anxiety compared to heterosexual adolescents (Ploderl & Tremblay, 2015). This discrepancy is found across sexual orientation identifications and for females and males although effect sizes are generally larger for males. Previous studies have measured anxiety rates using questionnaires or self-report of professional diagnosis. No studies utilised a structured diagnostic tool to assess the risk of anxiety disorders in sexual minority adolescents.

Suggested mechanisms responsible for elevated anxiety among sexual minority adolescents generally focus on "minority stress" theory (Meyer, 2003). Sexual minorities are predicted to experience stigmatisation and discrimination from the social environment resulting in psychopathology either directly, or indirectly via minority-specific processes (including internalised homophobia, concealment, and expectations of rejection) or general psychological processes such as lower self-esteem and rumination (Meyer, 2003; Hatzenbuehler, 2009).

In line with this theory, Birkett, Newcomb and Mustanski (2015) reported that higher levels of victimisation predicted greater levels of later distress (measured by the Brief Symptoms Inventory) in sexual minority adolescents. Victimisation has also been found to be a significant mediator of the effect of sexual orientation on depressive symptoms and suicidality (Burton, Marshal, Chisolm, Sucato & Friedman 2013). One short-term prospective study of *heterosexual* adolescents reported homophobic victimisation was a predictor of increased anxiety at the beginning and end of the school year (Poteat, Scheer, DiGiovann, & Mereish, 2014). However, no previous longitudinal studies have investigated the contribution of victimisation to the increased risk of anxiety in sexual minority adolescents. Some evidence for the role of general psychological risk factors has been reported. Hershberger and D'Augelli (1995) reported that in sexual minority youth, low self-esteem mediated the relationship between victimisation and poor mental health measured by the Brief Symptoms

Inventory. The mediating effect only occurred in combination with family support. Ploderl and Fartacek (2005) found controlling for self-esteem attenuated the relationship between sexual minority status and suicidality. The role of self-esteem in anxiety among sexual minority youth is yet to be studied longitudinally.

Another possible risk factor for psychopathology in sexual minority youth is childhood gender nonconformity (CGN). CGN has been associated with adult homosexuality in retrospective studies (e.g. Bailey & Zucker, 1995) and one prospective study (Steensma, van der Ende, Verhulst & Cohen-Kettenis, 2012). CGN may be associated with poorer mental health by acting as a behavioural marker of a stigmatised status, even before the young person self-identifies with a sexual minority orientation, thus eliciting victimisation and rejection from others. Alanko et al. (2009) found recalled CGN to be associated with increased levels of anxiety and depression, with this association strongest among sexual minorities. In sexual minorities, CGN was also found to partly account for higher prevalence of abuse before 11 years and post-traumatic stress disorder in adulthood (Roberts, Rosario, Corliss, Koenen, & Austin, 2012). These studies relied on retrospective CGN measures and are thus open to recall bias. In a cross-sectional study of Dutch adolescents (van Beusekom, Baams, Bos, Overbeek & Sandfort, 2016), self-reported gender nonconformity was associated with self-reported social interaction anxiety. This association was partially mediated by homophobic victimisation and the mediation effect was strongest for individuals reporting the highest levels of same sex attraction and for boys. There are no prospective studies investigating the role of CGN (reported during childhood) and anxiety disorders in sexual minority adolescents.

The current study is the first to use a birth cohort sample to prospectively investigate the relationship between adolescent minority sexual orientation and risk of anxiety disorders using a structured diagnostic tool. Furthermore, the study examines the effects of adjusting for bullying reported at 16 years, self-esteem reported at 17.5 years and CGN rated by the mother at 30, 42 and

57 months and by the child at 8 years. It is hypothesized that minority sexual orientation reported at 15.5 years will be associated with diagnosis of an anxiety disorder at 17.5 years and the strength of the association will be reduced after adjusting for bullying, self-esteem and CGN. In line with recommendations from Hatzenbuehler (2009) to avoid missing potential sex differences and due to previous findings of sex differences in sexual minority youth for anxiety (Ploderl & Tremblay), self-esteem (Galliher, Rostosky & Hughes, 2004), bullying (D'Augelli, Pilkington & Hershberger, 2002) and gender nonconformity-related victimisation (Roberts, Rosario, Slopen, Calzo & Austin, 2012), analyses are conducted separately for girls and boys.

Method

Sample

Secondary data was sourced from the Avon Longitudinal Study of Parents and Children (ALSPAC). All pregnant women in the Avon Health Authority in the UK with due dates between April 1st 1991 and 31st December 1992 were approached. Written informed consent was provided by participants after receiving a study description. This resulted in a core cohort of 14,541 pregnancies. 14,062 were live births and 13,988 babies were alive at 1 year. Additional recruitment (described in Boyd et al., 2012) resulted in a total sample size of 15,247 pregnancies, resulting in 15,458 foetuses for analyses using data collected after the age of seven. Of this total sample 14,775 were live births and 14,701 were alive at 1 year. A random 10% sample of the cohort attended clinics at the University of Bristol at various time intervals between 4 to 61 months of age. The sample was broadly representative of the general population although non-white minority ethnic groups were underrepresented (Boyd et al., 2012). The study website contains details of all the data that is available through a fully searchable data dictionary:

http://www.bris.ac.uk/alspac/researchers/data-access/data-dictionary/

At 17.5 years 10,101 participants (65% of the original cohort) were invited to a research clinic; the analyses presented are based on the 4,564 participants who completed the Clinical Interview

Schedule-Revised during this session. To identify potential attrition bias, CIS-R respondents and the remainder of the sample were compared on main study variables. In the CIS-R sample there was a greater proportion of white participants ($\chi^2(1, 12150)=7.2$, $p=.007$) and mothers in professional/skilled occupations ($\chi^2(1, 11127)=100.6$, $p<.001$). Girls who completed the CIS-R reported lower gender nonconformity at 8 years than girls in the non-CIS-R sample (CAI M=39.7, SD=12.4 vs M=40.7, SD=12.6, t(3567)=2.4, $p=.015$). Boys who completed the CIS-R had higher mother and child-reported gender nonconformity than boys in the non-CIS-R sample (PSAI M=54.0, SD=3.1 vs M=54.5, SD=3.1, t(4045)=5.4, $p<.0005$; CAI M=59.3, SD=11.2 vs M=60.3, SD=11.7, t(3478)=2.6, $p=.009$). CIS-R and non-CIS-R samples did not differ on other analysis variables.

Ethical approval

Ethical approval for the study was obtained from the ALSPAC Law and Ethics Committee (see http://www.alspac.bris.ac.uk and King's College London College Research Ethics Committee (ref. PNM/14/15-67).

Measures

Anxiety outcome: Clinical Interview Schedule-Revised (CIS-R)

The outcome variable was an ICD-10 diagnosis of any anxiety disorder at 17.5 years according to the computerised CIS-R (Lewis, Pelosi, Araya & Dunn, 1992; Patton et al., 1999). The CIS-R is fully standardised and both the computerized and interview versions are reliable measures of psychiatric disorders (Lewis et al., 1988; Lewis et al., 1992; Lewis, 1994).The outcome variable is binary, indicating the presence or absence of at least one of the following diagnoses: generalised anxiety disorder, agoraphobia, social phobia, specific phobia or panic disorder.

Sexual orientation

Sexual orientation was assessed only at 15.5 years. Participants were asked to choose from a list, "the description that best fits how you think about yourself". Of the 4,564 CIS-R respondents at 17.5 years, 3,600 had responded to the sexual orientation question. Due to small sample sizes, and in line with previous research using this sexual orientation variable (Pesola, Shelton & van de Bree, 2014), a dichotomous 'heterosexual verses non-heterosexual' variable was computed. Of the 3,600 participants, 86.8% (n=3126) identified as "100% heterosexual (straight)" and were coded as heterosexual. Respondents were coded as non-heterosexual (n=405, 11.3%) if they identified as: "mostly heterosexual, but also attracted to own sex" (n=333, 9.3%), "mostly homosexual, but also attracted to opposite sex" (n=17, 0.5%), "100% homosexual (gay)" (n=9, 0.3%) or "bisexual (equally attracted to both sexes)" (n=46, 1.3%). Those who responded "not sure" (n=57, 1.6%) or "not sexually attracted to either sex" (n=12, 0.3%), were excluded. Previous research indicates that most individuals identifying as asexual or "unsure" in middle adolescence later identify as heterosexual and at no point consider themselves a sexual minority; it would therefore be inappropriate to categorise these participants as non-heterosexual and compare them to those identifying as exclusively heterosexual (Ott, Corliss, Wypij, Rosario & Austin, 2011).

Gender behaviour

- *Pre-School Activities Inventory (PSAI)*

When the child was 30, 42 and 57 months, mothers completed the PSAI (Golombok & Rust, 1993). The scale consists of 24 items, 12 stereotypically masculine such as "plays with tool set" and 12 stereotypically feminine such as "plays with jewellery". The PSAI has good reliability (Cronbach's alpha 0.84 for male items and 0.90 for female items) and construct validity (Cvencek, Greenwald & Meltzoff, 2011). Items are divided into 3 scales; a Toy scale (7 items), Activity scale (11 items) and Character scale (6 items). Parents were asked to report if their child displayed behaviours "never", "hardly ever", "sometimes", "often" or "very often"; responses were given a score from 1-5

(respectively). The Character scale was excluded when calculating PSAI scores as the items about avoiding risks, exploring new surroundings, interest in snakes, spiders or insects, and avoiding getting dirty may overlap with anxiety disorder symptoms. The PSAI is scored by summing items before subtracting the feminine items from the masculine. A transformation is performed resulting in scores with a mean close to 50. Scores above 50 indicate more masculine behaviour. A mean of transformed Toy and Activity scale scores across the three time points was used for analysis.

- *Childhood Activities Inventory (CAI)*

At 8 years, children completed the CAI in face-to-face interviews. The CAI is a 16 item version of the PSAI with added age-appropriate items; it has a reported split-half reliability of .64 and CAI scores at 8 years were found to be associated with PSAI scores in earlier childhood (Golombok et al., 2008). The child was presented with two envelopes each corresponding to one CAI item. One statement, coloured blue, was framed to suggest the child did not engage in the behaviour (i.e. "Some children play with dolls"), the other statement, coloured red, was framed to suggest the child did engage in the behaviour (i.e. "Other children don't play with dolls"). The researcher read both statements and asked which the child identified with more. Study children posted the blue or red statement into one of two slots on a box; the slots indicated the statement was "sort of true for him/her" or "really true for him/her". Items were scored: 1 - really true they do not identify with behaviour; 2 - sort of true they do not identify with behaviour ; 3 - sort of true they do identify with behaviour ; 4 - really true they do identify with behaviour.

Bullying

At 16 years, a questionnaire asked participants to report if they had experienced "bullying by another person" since the age of 12 years. The dichotomous variable resulting from this question is the measure of bullying used. This variable was selected because it was assessed later than sexual orientation but referred to a time period prior to the anxiety outcome.

Self-esteem: Bachman self-esteem scale

The Bachman revision of the Rosenberg's Self-Esteem Scale (Bachman, 1970; Rosenberg, 1965) was completed by study children at 17.5 years in an online survey. The scale has good internal consistency (Cronbach alpha = .75) and construct validity (Bachman & O'Malley, 1977). The measure consists of 10 statements rated on a scale from 1 "almost always true" to 5 "never true". Higher scores indicate higher self-esteem. This variable was selected as it was measured later than sexual orientation.

Demographic covariates

Statistical models were adjusted for maternal occupation and ethnicity as socio-economic status and ethnicity are associated with risk for mental health problems before adulthood (Johnson, Cohen, Dohrenwend, Link & Brook, 1999; Stansfeld et al., 2004). Maternal occupation was dichotomised into "Skilled/managerial/professional" versus "Partly skilled/unskilled" (Dale & Marsh, 1993). Ethnicity was dichotomised into "White" versus "Non-white" categories due to small numbers of non-white individuals.

Data analysis

Missing values

Due to the longitudinal design, there is a high level of sample attrition and missing data. To combat power and sample size issues, multiple imputation was executed using the *mi impute* chained command in Stata. This imputation command accommodates multivariate imputation with both continuous and categorical variables displaying arbitrary missing value patterns. Seventy imputations were carried out based on levels of missing data in the analysis variables within the original cohort. Pre-imputation analysis confirmed data were missing at random. A small imputation model was implemented based on recommendations from previous literature (White, Royston and

Wood, 2011; Thoemmes and Rose, 2014). All analysis variables were included alongside a select number of auxiliary variables which a) related to the missing-ness of the analysis variables and b) were independently associated with the outcome variable. All imputation model variables are displayed in Appendix 1 which displays the missingness of analysis and auxiliary variables within the outcome variable (anxiety). Current recommendations are against the use of imputed outcome measures in analysis (White et al., 2011). Hence, the present analysis was based upon imputed cases with complete outcome variable data.

Statistical analysis

Analysis was performed in Stata version IC 14.1. Logistic regression analyses were conducted to predict the odds ratios of participants having an anxiety disorder at 17.5 years by sexual orientation at 15.5 years, adjusting for covariates. An initial unadjusted model tested the association between anxiety disorder at 17.5 years (the dependent variable) and sexual orientation at 15.5 years (the independent variable). Five further logistic regression models were conducted adjusting for covariates in a sequential manner: step 1) maternal occupation and ethnicity; step 2) mother-reported CGN between 30 and 57 months; step 3) child-reported CGN at 8 years, step 4) bullying from 12-16 years and step 5) self-esteem at 17.5 years. Analyses were carried out separately for girls and boys. Analyses were carried out with the original complete-case dataset and multiple imputation datasets for comparison. Logistic regression with multiply imputed data was carried out with the prefix command *mi estimate*. This command performs logistic regression on original data and the 70 sets of imputed data and produces output of the pooled result. After each step of the analysis, variance of results between and within the imputation models was checked using the *vartable* option of the *mi estimate* command.

Results

Sample characteristics

There were more females (n=2567; 56.2%) than males (n=1996; 43.7%; χ^2=413.53, *p*<.001). Prior to imputation, 405 participants (11.3%) identified as non-heterosexual at 15.5 years. A higher percentage of girls were non-heterosexual compared to boys (14% versus 8.2%, $\chi^{2=}$36.87, *p*<.001). Heterosexual and non-heterosexual participants were compared on study variables using t-tests and chi-square analyses, with the two sexes analysed separately (Table 1). There were no significant differences in ethnicity or maternal occupation between the heterosexual and non-heterosexual participants. For both sexes, relative to heterosexual participants, non-heterosexual youth were more likely to have an anxiety disorder diagnosis at 17.5 years, more likely to have been bullied between the ages of 12-16 years and had lower self-esteem. Mother-reported gender nonconformity was higher for non-heterosexual compared to heterosexual participants. Compared to boys that identified as heterosexual at 15.5 years, boys who subsequently reported non-heterosexual orientation had significantly higher self-reported gender nonconformity at 8 years. For girls there was a non-significant trend in the same direction.

----------Table 1 ----------

Logistic regression analyses

In the unadjusted univariate models for girls and boys, non-heterosexuality at 15.5 years was significantly associated with the presence of an anxiety disorder diagnosis at 17.5 years (Step 0, Table 2). Adjusting for maternal occupation and ethnicity did not affect these associations (Step 1, Table 2). All subsequent analyses adjusted for these two covariates.

Neither mother-reported or child-reported CGN were significantly associated with the risk of an anxiety disorder. For girls and boys, adjusting for CGN did not reduce the association between sexual orientation and anxiety disorder diagnosis (Step 3, Table 2).

Both girls and boys who experienced bullying between 12-16 years had higher odds of anxiety disorder diagnosis at 17.5 years (Step 4, Table 2). Additionally, adjusting for bullying decreased the odds ratios (ORs) between sexual orientation and anxiety diagnosis and increased the variance explained by the overall models. For girls only, mother-reported CGN now shows a significant association with anxiety disorder at 17.5 years.

In the final step, for both girls and boys, low self-esteem was significantly associated with anxiety disorder diagnosis at 17.5 years (Step 5, Table 2). Both sexual orientation and bullying also remained significant independent predictors. However, adjusting for self-esteem at 17.5 years further reduced the ORs between sexual orientation and anxiety diagnosis and further increased the variance explained by the overall models. Inclusion of self-esteem also reduced the association between bullying and anxiety disorder diagnosis. For girls only, child-reported CGN now shows a significant association with anxiety at 17.5 years.

----------Table 2 ----------

Variance tests inferred small amounts of between- and within-model variance and high relative efficiency (>.995) at every step of analysis, indicating a consistent pattern of results between- and within-imputation models. The pattern of findings for the non-imputed dataset was similar to that found for the imputed data (Appendix 2).

Discussion

This is the first study to investigate the risk for anxiety disorders in sexual minority compared to heterosexual youth using a structured clinical assessment in a prospective birth cohort sample. Individuals reporting minority sexual orientation at 15.5 years were more likely to have an anxiety disorder at 17.5 years than those reporting heterosexual orientation (unadjusted ORs approximately

2.5 for girls and boys). The finding of increased risk for an anxiety disorder in sexual minority youth is consistent with the study hypothesis and previous studies using questionnaire ratings of anxiety symptoms (Williams & Chapman, 2011).

Being bullied between 12-16 years was a significant independent risk factor for an anxiety disorder at 17.5 years. This is consistent with previous studies in general population samples in which bullying was associated with elevated rates of anxiety disorders (Stapinski et al., 2014). Sexual minority youth were more likely to report having been bullied than heterosexual participants and adjusting for bullying reduced the strength of the association between minority sexual orientation and anxiety. Whilst full mediation models were not tested in this study, these findings imply bullying may account for some of the association between non-heterosexual orientation and anxiety. This is consistent with the study hypothesis and prior youth research reporting that bullying mediated the association between sexual orientation and other forms of psychological distress (e.g., depression and suicidality) (Burton et al., 2013).

Lower self-esteem was also associated with the risk of an anxiety disorder. Sexual minority youth had lower self-esteem than heterosexual participants and, in line with the study hypothesis, adjusting for self-esteem reduced the strength of the association between non-heterosexual orientation and anxiety. This is consistent with one cross-sectional study of sexual minority college students that reported lower self-esteem to be associated with increased self-reported anxiety (Woodford, Kulick & Atteberry, 2015). Furthermore, findings are consistent with minority-stress model predictions that social stigma may become internalised resulting in lower self-esteem, in turn leading to greater psychological distress in sexual minority individuals (Hatzenbuehler, 2009). However, as self-esteem was measured at the same time as anxiety disorders here, it is possible that the presence of an anxiety disorder resulted in reduced self-esteem. Further investigation using

mediation analyses in prospective studies is required where self-esteem measures precede measurements of mental health outcomes.

Mother-reported childhood gender nonconformity, at 30, 42 and 57 months, was significantly higher in adolescents who reported later sexual minority sexual orientation. The association between CGN and subsequent sexual orientation is consistent with previous retrospective studies (Bailey & Zucker, 1995) and one prospective study in a Dutch general population sample (Steensma et al., 2013). In the study by Steensma et al. (2013), parents rated CGN at a later age (mean age 7.5 years, with a range of 4-11 years) compared to 30-42 months in the present study. Furthermore and sexual orientation was measured 24 years later (mean age 30.9 years), compared to 15.5 years in this study. This demonstration of an association in two prospective population studies suggests an important developmental link between CGN and sexual orientation. However, both studies suggest the association is smaller than in studies of clinically-referred gender nonconforming children (Bailey, Vasey, Diamond, Breedlove, Vilain, & Epprecht, 2016). The present study is the first prospective investigation using child-rated CGN. In boys who subsequently reported non-heterosexual orientation, child-reported CGN at age 8 years was significantly higher than for heterosexual youth; for girls there was a non-significant trend in the same direction. It should be noted that the measure of gender nonconformity did not ask about gender identity or gender dysphoria, both of which require further investigation in relation to subsequent sexual orientation and anxiety. Furthermore, some participants who might otherwise have reported a minority sexual orientation may have indicated that they were heterosexual or 'not sure' due to a gender identity different to their sex assigned at birth.

Although CGN was associated with minority sexual orientation, CGN had little effect on the association between sexual orientation and risk of an anxiety disorder. This does not support the study hypothesis and contrasts with a previous longitudinal study using recalled CGN measures

which found that CGN partly accounted for the increased rates of a specific anxiety disorder (post-traumatic stress disorder) in sexual minority youth relative to heterosexuals (Roberts et al., 2012). The current study benefited from using a well-validated measure of gender roles, rated by a parent and the child at appropriate ages. Futhermore, CGN items potentially confounding with our primary outcome measure were removed. Although gender nonconformity shows considerable stability between 30 months to 8 years (Golombok et al., 2008), there is less known about continuity into adolescence. It is possible adolescent gender nonconformity would be associated with increased risk of anxiety disorders, particularly as adolescence is a time when concerns about social evaluation and peer acceptance increase. This requires further research.

Strengths of the study included the use of a large, well characterised prospective birth cohort and a validated structured clinical assessment of anxiety disorders. Of the individuals who completed the CIS-R, 10.2% were considered to have a diagnosable anxiety disorder. This rate is comparable to the ranges suggested by previous epidemiological research of child and adolescent anxiety disorders (Beesdo, Knapp & Pine, 2009). Attrition is to be expected in a prospective study design, which can lead to biases in estimates. Multiple imputation was used to both reduce the risk of bias and increase statistical power. The pattern of findings was similar for non-imputed and the imputed datasets.

In the current stigmatising context, sexual minority individuals should be offered interventions to help improve resilience, such as group-based interventions where youth can learn coping skills and gain social support (Craig, Austin & McInroy, 2014). For those who have already developed psychological problems, interventions such as cognitive behaviour therapy could be modified to address issues unique to sexual minority individuals (Pachankis, Hatzenbuehler, Rendina, Safren & Parsons, 2015). Families could be offered interventions, as evidence suggests family support may have protective effects (Mustanski, Newcombe & Garofalo, 2011). Moreover, legal protection and

education-based interventions are important (Hatzenbuehler, McLaughlin, Keyes & Hasin, 2010; Hatzenbuehler, Birkett, Van Wagenen & Meyer, 2014).

Limitations of this study include the possibility that minority sexual orientation was under-reported. This is a recurring issue in sexual orientation research due to the stigma associated with non-heterosexuality. Under-reporting may have been more likely at the time of the data collection (October 2006 to June 2008) when societal stigma in the UK was more negative than at present (Mercer et al., 2013). Furthermore, sexual orientation was assessed with a single question about identity and sexual attraction but did not reference behaviour. Sexual orientation was assessed at one time-point so this study cannot take into account change in sexual identity over time, especially known among females (Bailey et al., 2016). Additionally, due to the relatively small number of participants reporting minority sexual orientations and consequent power implications, all those not exclusively heterosexual were combined. There is increasing evidence bisexual individuals may be at increased risk for some mental health problems (Ploderl & Tremblay, 2015; Marshal et al., 2011). Furthermore, it has been argued that 'mostly heterosexual' should be viewed as a distinct sexual orientation (Savin-Williams & Vrangalova, 2013). Hence, research with larger samples is needed so that sexual orientation subgroups can be compared. Non-white participants and those with mothers in unskilled occupations were under-represented; research is required with more diverse cohorts, especially as minority stress theory suggests multiple stigmatised identities could result in greater adverse psychological outcomes. Furthermore, compared to participants who did not complete the CIS-R, girls who completed the CIS-R reported low gender nonconformity at 8 years and boys who completed the CIS-R reported higher gender nonconformity at 8 years. This could have resulted in biases in CGN results. The study was also limited regarding the timing of study variables and their availability within the larger ALSPAC dataset. This meant that mediation analysis was not undertaken because self-esteem was measured at the same time-point as the anxiety outcome, rather than at an intermediate point between sexual orientation and anxiety. Furthermore, bullying was assessed

using an unstandardised measure and only up to the age of 16; it is likely bullying experienced between 16-17 years would also have contributed to anxiety at 17.5 years. A stronger study design would include assessment of variables at multiple, contiguous time-points.

Conclusion

Sexual minority adolescents are at increased risk for anxiety disorders. This relationship is weakened when adjusting for bullying and lower self-esteem, but remains significant. This suggests that clinical assessment and intervention for anxiety disorders should address victimisation experiences and self-esteem among sexual minority adolescents. Other factors contributing to the increased risk require investigation.

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Table 1 Comparison of heterosexual and non-heterosexual participants on study variables for both sexes (before imputation)

	Females				**Males**			
	Heterosexual (N=2,311)	Non-heterosexual (N=367)			Heterosexual (N=2,159)	Non-heterosexual (N=205)		
Outcome	***N (%)***	***N (%)***	***χ2, p***	**Cohen's d (95% CIs)**	***N (%)***	***N (%)***	***χ2, p***	**Cohen's d (95% CIs)**
Anxiety diagnosis								
Absent	1,512(89.8)	216(78.5)	28.7,	.24 (.15-.33)	1,368(94.9)	114(88.4)	9.3,	.15 (.06-.25)
Present	172(10.2)	59(21.5)	*p*<.001		74(5.1)	15(11.6)	*p*=.002	
Dichotomous Covariates								
Maternal occupation								
Professional,	1,593 (83.6)	241 (81.1)	1.1,	.04 (-.04-.13)	1,544 (84.2)	150(84.7)	.03,	.01 (-.08-.10)
managerial or skilled			*p*=.296				*p*=.858	
Partly skilled or unskilled	313(16.4)	56(18.9)			289(15.8)	27(15.3)		
Child Ethnic background								
White	2,025(96.0)	316(95.5)	.2,	.02 (-.06-.11)	1,891(95.9)	175(94.6)	.7,	.04 (-.05-.12)
Non White	85(4.0)	15(4.5)	*p*=.668		81(4.1)	10(5.4)	*p*=.401	
Bullying 12-16 years								
Yes	304(17.4)	73(26.0)	11.9,	.15 (.07-.24)	168(12.6)	37(28.9)	25.9,	.27 (.17-.37)
No	1,448(82.6)	208(74.0)	*p*=.001		1,169(87.4)	91(71.1)	*p*<.001	

Continuous covariates	***Mean (SD)***	***Mean (SD)***	***t, p***	**Cohen's d (95% CIs)**	***Mean (SD)***	***Mean (SD)***	***t, p***	**Cohen's d (95% CIs)**
Gender nonconformity[ǂ]								
Mother-reported	43.2(3.1)	44.0(3.2)	-4.0, *p*<.001	-.26 (-.39- -.13)	54.2(3.1)	52.9 (3.3)	5.2, *p*<.001	.43 (.27-.61)
Child-reported	39.6(12.4)	40.9(13.0)	-1.7, *p*=.092	-.10 (-.22-.02)	59.8(11.4)	57.3 (10.7)	2.6, *p*=.009	.22 (.05-.38)
Bachman's self-esteem score	27.7(6.5)	26.3(6.9)	3.2, *p*=.002	.21 (.08-.33)	29.7(6.0)	28.4(6.8)	2.4, *p*=.017	.23 (.04-.42)

[ǂ] Higher scores on Gender nonconformity scales indicate more masculine behaviour.

Table 2. Results of post-imputation logistic regression analyses for girls (n=2,567) and boys (n=1,996), separately.

Analysis step and variables	Odd's ratio (95% CI)	*p*-value	R-square
	GIRLS		
Step 0 Sexual orientation (SO)	 2.55 (1.85-3.52)	 *p*<.001	.02
Step 1 SO Maternal occupation Ethnicity	 2.53(1.84-3.50) .75(.55-1.03) 1.34(.77-2.32)	 *p*<.001 *p*=.076 *p*=.303	.02
Step 2 SO Mother-report CGN[a]	 2.54(1.84-3.51) .97(.94-1.01)	 *p*<.001 *p*=.262	.02
Step 3 SO Child-report CGN Mother-report CGN	 2.54(1.84-3.52) 1.01(1.00-1.02) .97(.94-1.00)	 *p*<.001 *p*=.113 *p*=.074	.03
Step 4 SO Bullying Child-report CGN Mother-report CGN	 2.34(1.69-3.25) 2.25(1.65-3.05) 1.01(1.00-1.02) .96(.93- 1.00)	 *p*<.001 *p*<.001 *p*=.061 *p*=.037	.04
Step 5 SO Self-esteem Bullying Child-report CGN Mother-report CGN	 2.14(1.52-3.01) .89(.88- .91) 1.85(1.33-2.57) 1.01(1.00-1.03) .97(.93-1.00)	 *p*<.001 *p*<.001 *p*<.001 *p*=.023 *p*=.068	.12
	BOYS		
Step 0 Sexual orientation	 2.48(1.40-4.39)	 *p*=.002	.01
Step 1 SO Maternal occupation Ethnicity	 2.48(1.40-4.39) .96(.55-1.67) 1.07(.42-2.67)	 *p*=.002 *p*=.879 *p*=.885	.01
Step 2 SO Mother report CGN	 2.44(1.37-4.33) .98(.93-1.03)	 *p*=.002 *p*=.456	.01
Step 3 SO Child-report CGN Mother-report CGN	 2.44(1.37-4.33) .01(.98-1.02) .98(.93-1.03)	 *p*=.002 *p*=.960 *p*=.493	.01
Step 4 SO Bullying Child-report CGN Mother-report CGN	 2.10(1.17-3.79) 2.62(1.61-4.27) 1.00(.98-1.02) .98(.93-1.04)	 *p*=.013 *p*<.001 *p*=.927 *p*=.512	.04
Step 5			.08

SO	1.93(1.06-3.54)	*p*=.032	
Self-esteem	.91(.88- .94)	*p*<.001	
Bullying	2.32(1.39-3.85)	*p*=.001	
Child-report CGN	1.00(.98-1.02)	*p*=.906	
Mother-report CGN	.99(.94-1.04)	*p*=.685	

Note: Maternal occupation and ethnicity were controlled for at every step of analysis but not reported after Step 1 as they did not influence outcomes.

[a] *CGN = childhood gender nonconformity*

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Key Points

- Sexual minority adolescents are at greater risk of anxiety symptoms than heterosexual youth according to self-report questionnaires.
- Here, reporting a non-heterosexual orientation at 15.5 years was associated with approximately 2.5 times the risk of an anxiety disorder at 17.5 years, relative to heterosexual participants.
- Sexual minority youth had higher childhood gender nonconformity, were more likely to report bullying between 12-16 years and had lower self-esteem at 17.5 years.
- Adjusting for bullying and self-esteem reduced the association between sexual orientation and the presence of an anxiety disorder at 17.5 years, but adjusting for childhood gender nonconformity had little effect on the association.
- Preventative and treatment interventions for anxiety in sexual minority adolescents should address the impact of bullying and low self-esteem.

Appendices

Appendix 1. Variables used in the imputation model and number of cases with complete data on these measures

Class	Variables	Measure	Age	Complete N	% missing within those with complete cases of outcome
Main analysis variables	Anxiety disorder diagnosis at 17years	Computerised Interview Schedule-Revised (CIS-R), clinical session	17.5 years	4,564	0
	Mean Toy and Activity Scale PSAI Gender conformity score	Mother-completed Pre-school Activities Inventory	30, 42 and 57 months	7,819	27.3
	CAI gender conformity score	Child-completed Childhood Activities Inventory	8 years	7,055	20.2
	Sexual orientation	Computer task item, clinic session	15.5 years	5,048	22.6
	Report of bullying from 12-16years	Item on self-report questionnaire	16 years	5,068	29.2
	Self-esteem score at 17 years	Bachman self-esteem questionnaire, self-report online survey	17.5 years	4,497	12.1
Demographic Covariates	Maternal occupation		32 weeks	11,127	18.4
	Child Ethnic background		32 weeks	12,150	10.3
Auxiliary variables with earlier measures	Anxiety disorder diagnosis	Development and Wellbeing Assessment (child self-report)	13 years	7,108	19.0
	Anxiety disorder diagnosis	Development and Wellbeing Assessment (child self-report)	15 years	5,371	18.9
	Bullying by sibling	Child report, paper questionnaire	12 years	6,928	24.4
	Maternal education	Parental questionnaires	32 weeks	12,493	9.1

Appendix 2. Table of complete case analysis (i.e. prior to imputation) logistic regression results

		GIRLS			
	N	Odd's ratio	95% Confidence interval	p-value	R-square of whole model
Step 0	1,959	2.40	1.73-3.33	p<.001	.02
Step 1	1,588	2.53	1.86-3.64	p<.001	.02
Step 2	1,300	2.64	1.77-3.95	p<.001	.02
Step 3	1,173	2.86	1.88-4.35	p<.001	.03
Step 4	1,001	2.43	1.52-3.87	p<.001	.04
Step 5	918	2.56	1.52-4.30	p<.001	.12
		BOYS			
Step 0	1,571	2.43	1.35-4.37	.003	.01
Step 1	1,311	2.26	1.17-4.34	.014	.01
Step 2	1,113	2.52	1.29-4.94	.007	.02
Step 3	983	2.06	.96-4.39	.062	.01
Step 4	767	1.60	.63-4.05	.322	.04
Step 5	691	1.60	.61-4.25	.338	.10

Appendix 3. Table of complete case analysis logistic regression results with each covariate association reported for each step of analysis

		GIRLS			
Analysis step	N	Odd's ratio	95% Confidence interval	p-value	R-square of whole model
Step 0 Sexual orientation	1,959	2.40	1.73-3.33	p<.001	.02
Step 1 Sexual orientation - SES - Ethnicity	1,588	 2.53 .80 1.06	 1.86-3.64 .541-1.19 .470-2.41	 p<.001 .275 .881	.02
Step 2 SO Toy and Activity PSAI score	1,300	 2.64 .97	 1.77-3.95 .913-1.02	 p<.001 .225	.02
Step 3 SO CAI score PSAI score	1,173	 2.86 1.02 .94	 1.88-4.35 1.00-1.03 .887-1.00	 p<.001 .047 .066	.03
Step 4 SO Bullying 12-16 CAI score PSAI score	1,001	 2.43 1.80 1.01 .94	 1.52-3.87 1.13-2.87 .994-1.03 .875-.999	 p<.001 .013 .209 .048	.04
Step 5 SO Self-esteem Bullying 12-16 CAI score PSAI score	918	 2.56 .89 1.47 1.02 .93	 1.52-4.30 .859-.919 .864-2.48 1.00-1.04 .866-1.00	 p<.001 p<.001 .156 .043* .051	.12
		BOYS			
Analysis step	N	Odd's ratio	95% Confidence interval	p-value	R-square
Step 0 Sexual orientation	1,571	2.43	1.35-4.37	.003	.01
Step 1 Sexual orientation - SES - Ethnicity	1,311	 2.26 1.22 1.39	 1.17-4.34 .593-2.49 .485-3.97	 .014 .594 .541	.01
Step 2 SO	1,113	 2.52 .97	 1.29-4.94 .899-1.05	 .007 .503	.02

Toy and Activity PSAI score					
Step 3	983				.01
SO		2.06	.964-4.39	.062	
CAI score		.99	.970-1.02	.570	
PSAI score		.10	.913-1.09	.929	
Step 4	767				.04
SO		1.60	.631-4.05	.322	
Bullying 12-16		3.22	1.63-6.37	.001	
CAI score		1.00	.975-1.03	.803	
PSAI score		1.06	.958-1.17	.260	
Step 5	691				.10
SO		1.61	.609-4.25	.338	
Self-esteem		.90	.847-.953	.000	
Bullying 12-16		3.20	1.55-6.64	.002	
CAI score		1.01	.977-1.04	.546	
PSAI score		1.04	.931-1.16	.500	

After Step 1 all subsequent analysis models adjusted for SES and Ethnicity.